

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Fuel Injection Nozzle for Internal-Combustion Engines

I, KARL UCCUSIC, of 156, Sieveringerstrasse, Vienna XIX., Austria, of Austrian nationality, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a fuel injection nozzle for internal combustion engines of the type in which the valve member, closes in the opposite direction to that in which the fuel is delivered, and is arranged in a chamber situated at a distance from the nozzle outlet. This chamber prevents the removal of heat from the nozzle outlet, exposed to the combustion gases, over the nozzle body. It is however harmful to remove the heat over the valve seat as this heats and damages the valve seat. It has therefore already been suggested in the case of such nozzles to form this chamber by a tubular inserted piece arranged between the fuel inlet member and the nozzle body, so that there exists between the nozzle body and the seat of the valve member a separation which prevents the flow of heat. In the known constructions of this type there is a disadvantage that these said separations which have a favourable effect on the valve seat, are detrimental to, and prevent the removal of heat from the nozzle body, so that the nozzle body becomes too hot and the nozzle outlet tends to coke.

According to the present invention the solution does not lie in the removal of heat from the nozzle to the surrounding parts but in the direct cooling of the nozzle body by the fuel to be injected. The invention thus consists in a fuel injection nozzle for internal combustion engines having a valve member which is moved into the closed position in the opposite direction to that in which the fuel is delivered, the said valve being arranged at a distance from the nozzle outlet in a chamber formed by a tubular insert arranged between the fuel feed member and the nozzle body so that there exist between the nozzle body, i.e. the member containing the outlet bores and the said valve member separating interfaces which obstruct

the flow of heat from the nozzle body to the said feed member, and a fuel conduit in the nozzle body leading from the said chamber to the nozzle outlet bore or bores, characterised in that the nozzle body has a tubular extension through which fuel passes to the nozzle outlet bore or bores provided at its end, and the outside diameter of the nozzle extension is not greater than half the diameter of the outside diameter of the nozzle body, and the length of which is at least twice its diameter, the said nozzle extension being insulated by an insulating sheath from the parts of the nozzle surrounding it.

If the tubular extension of the nozzle body which extends into the combustion chamber has a greater diameter than the diameter previously stated, it has a larger surface irradiated by the combustion gases and its heat-storing mass is therefore greater, so that the delivery of fuel, which only takes a short time, through the fuel conduit to the nozzle outlet bore or bores cannot have the required cooling effect. With such small dimensions of the tubular nozzle extension the area which is irradiated by the combustion gases is small, and the heat-storing mass of this extension is slight, so that the liquid cooling by the fuel supplied to the nozzle outlet bore or bores can have a decisive effect.

A further object of the present invention is that the nozzle extension is screened from the surrounding parts i.e. from the nozzle holder or from the cylinder head, by an insulating sheath.

By the combining of these features, namely, a delicately constructed nozzle extension cooled by means of the flowing liquid and the screening of this extension from the surrounding parts irradiated by the combustion gases, the nozzle outlet can be kept at a temperature at which it does not tend to coke and that, in spite of this, heat effects can be extensively withdrawn from the valve seat, as the heat is no longer led off from the nozzle mouth over the nozzle body but by the liquid cooling.

In order to avoid this delicately constructed

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ted tubular extension being heated by the surrounding parts irradiated by the combustion gases, an insulating sheath made of any of the following recommended materials, heat resisting plastics, nickel steels, porcelain or a resin-impregnated asbestos marketed under the Registered Trade Mark "Klingerit", were shown to be advantageous.

According to the present invention this insulating sheath can enclose the tubular attachment with a small amount of clearance and also the clearance between this insulating sheath and the parts surrounding it can be kept small. These clearances will very soon become closed up during operation by coke formation, which results in a good insulation.

According to a further object of present invention the insulating sheath enclosing the tubular attachment has an annular flange known *per se* in order to both support the insulating sheath and to prevent, even in that region in which the nozzle body enlarges to a greater diameter, the flow of heat from the parts irradiated in the combustion chamber to the body of the nozzle by additional separating interfaces. For a further object of the present invention an insulating sheath having the same purpose can be constructed as a stepped sheath enclosing substantially the whole nozzle body, thus further completing its heat insulation. Several illustrative embodiments of the invention are shown in the accompanying drawing in which:—

Figure 1 is a sectional view of a fuel nozzle having an insulating sheath consisting of an annular portion and a sleeve.

Figure 2 is a sectional view of a fuel nozzle having a stepped sheath substantially enclosing the entire nozzle body.

The valve chamber 1 is defined mainly by a cylindrical insert, which is adjoined at its top by the fuel feed member 2 and at its bottom by the nozzle body 3. These three parts are of the same diameter and are centred in the nozzle holder 8. Due to the fact that the valve chamber 1 is formed by a cylindrical insert which is a separate part, separating interfaces are formed between the nozzle body 3 and the cylindrical insert and between the cylindrical insert and the fuel feed member 2, which interfaces may obstruct considerably the flow of heat, even if they are contacting each other, and by these additionally formed separating interfaces the fuel feed member 2 and the valve 5 are protected against superheating. The chamber 1 accommodates the valve, which consists, e.g. of a ball valve 4, a valve member 5 and a valve spring 6. The valve member 5 locates under compression of valve spring 6 the ball valve 4 on its seat and has at its lower end a transverse slot 7 to allow for the free flow of fuel to a fuel conduit 10 in the nozzle body. This conduit 10 leads from the valve chamber 1 to the nozzle outlet bore or bores 12 provided at the end of the extension 11 of

the nozzle body.

Since the nozzle holder 8 has the largest dimensions of the component parts of the nozzle it is essential to preclude a transfer of heat which is absorbed by the nozzle holder to the nozzle body. It is with this object that the invention provides insulating sheaths 9 and 9a which may take the form of (figure 1), a sleeve-like portion with an annular portion at its upper end, or (figure 2) a stepped sheath substantially enclosing the entire nozzle body.

The known provision of an insulating sheath between the nozzle body and the fuel inlet member and the provision of insulating sheaths according to the invention however are often insufficient for achieving the desired effect.

Whereas the insulating sheaths prevent a transfer of heat from the nozzle holder to the nozzle body it may also be endeavoured to reduce the transfer of heat from the nozzle body to the valve. The nozzle body extends, as shown at 11 into the combustion chamber of the engine and would conduct the heat absorbed by it.

If as the invention provides, the extension of the nozzle body 11 extending into the combustion chamber is formed with dimensions such that its outside diameter is not greater than half the outside diameter of the nozzle body, its outside diameter will therefore be of very small dimensions, and its length is at least twice its outside diameter thus the absorption of heat in that portion of the nozzle will be very low.

Experience has shown that the correct ratio between the length of the extension of the nozzle body and its diameter is of special importance. This ratio may be determined by calculation and empirically. In any case it has been found that optimum conditions can be achieved if the ratio between length and diameter is 2:1.

WHAT I CLAIM IS:—

1. A fuel injection nozzle for internal combustion engines having a valve member which is moved into the closed position in the opposite direction to that in which the fuel is delivered, the said valve being arranged at a distance from the nozzle outlet in a chamber formed by a tubular insert arranged between the fuel feed member and the nozzle body so that there exist between the nozzle body and the said valve member separating interfaces which obstruct the flow of heat from the nozzle body to the said feed member, and a fuel conduit in the nozzle body leading from the said chamber to the nozzle outlet bore or bores, characterised in that the nozzle body has a tubular extension through which fuel passes to the nozzle outlet bore or bores provided at its end, and the outside diameter of the nozzle extension is not greater than half the diameter of the outside diameter of the nozzle body, and the length of which is at least twice its diameter, the said nozzle extension being insu-

lated by an insulating sheath from the parts of the nozzle surrounding it.

5 2. A fuel injection nozzle according to claim 1, characterised in that the insulating sheath consists of an annular portion and of a sleeve-like portion which surrounds the said tubular extension of the nozzle body which extends into the combustion chamber.

3. A fuel injection nozzle according to Claim

2, characterised in that the insulating sheath consists of a stepped sheath substantially enclosing the entire nozzle body. 10

4. A fuel injection nozzle as claimed in Claims 1, 2 or 3, characterised in that the insulating sheath encloses the said extension of the nozzle body with a small amount of clearance. 15

MARKS & CLERK.

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COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of
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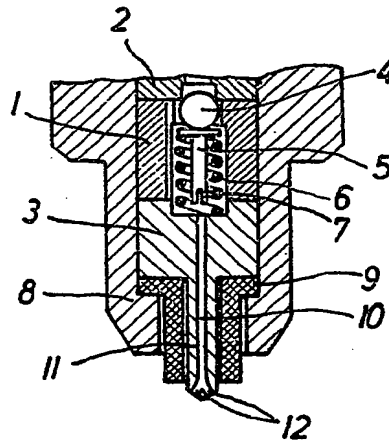


Fig. 1

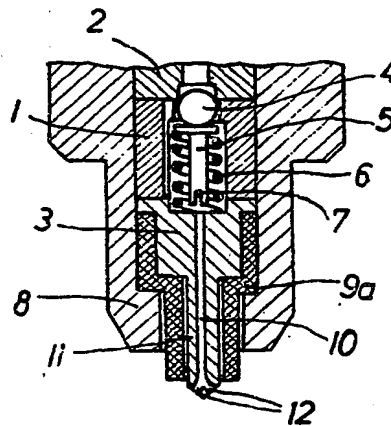


Fig. 2